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Cruise Report

R/V OCEANUS 29

July 6-13, 1977

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B. Butman
USGS
Woods Hole, MA

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Bridge Log

Ship: R/V OCEANUS

Cruise No. 29

Area of Operations: Mid Atlantic Bight
Georges Bank

Dates: Depart Woods Hole, Mass. 1400 6 July 1977
Return Woods Hole, Mass. 1100 13 July 1977

Personnel:

A. Mysona	Master	
B. Butman	Chief Scientist, USGS	(Oceanographer)
W. Strahle	USGS	(E. Engineer)
J. West	USGS	(E. Tech.)
C. Deadmon	USGS	(Tech.)
J. Vermersch	WHOI	(Research Associate)
L. Brand	WHOI	(Student)
R. Butman	Lincoln Lab	(Tech.)
M. Noble	USGS	(Physicist)
S. Pfirman	USGS	(Tech.)
C. Bloom	USGS	(Tech.)
R. Rice	USGS	(Tech.)

Objectives:

The objectives of OCEANUS 29 were:

1. Recover two and deploy four bottom instrument packages as part of continuing study of currents and sediment transport on Mid-Atlantic shelf and on Georges Bank.

2. Recover one current meter mooring and deploy two current meter moorings as part of continuing study of currents and sediment transport.

3. Make underway XBT observations of water temperature structure and obtain profiles of temperature and conductivity (CTD) along selected transects running across the shelf and along the shelf. The measurements were designed to determine the position of the shelf - slope water front, to aid in interpretation of current meter and bottom tripod data, to map the distribution of 'cold pool' water found on the shelf during summer, and to study mixing through the Great South Channel.

4. Replace and relight as necessary surface marker floats at tripod locations. The floats serve to mark the instrument locations, and deter fishing activity.

Narrative:

July 6	1400	Depart Woods Hole
	1500	Start XBT, CTD transect
		Problem with CTD wire termination - reterminated wire twice.
July 7		XBT and CTD observations, Great South Channel.
July 8	0830	At USGS mooring location 130.
		Deploy two surface markers approximately .25 nm apart.
	1030	Deploy tripod between surface markers. Survey position of markers and tripod.
	1130	Underway. XBT and CTD observations
	1900	Arrive USGS pilot current mooring site
	1930	Recover tripod (Mooring 126)
	2200	Recover current meter mooring (Mooring 118)
		Relight surface marker buoys
		Deploy surface buoy with current meter (Mooring 128)
July 9	0005	Deploy tripod (Mooring 132)
	0130	Deploy subsurface current mooring (Mooring 128)
	0200	Underway from Georges Bank mooring site
July 10		CTD and XBT observations. Track along 60m isobath, the estimated center of cold pool.
	1600	Arrive NOAA Meteorological Buoy (EB41)
	1700	Recover tripod (Mooring 122)

July 10 2000	Deploy tripod (Moording 129) Remove light from surface buoy Tripod data logger intended for deployment failed on deck. Attempt repair with tripod components recovered from Georges Bank and Mid-Atlantic stations.
~2200	At Wilmington Canyon tripod location. Hauled surface marker. Rough seas, difficult approaches. Surface marker light broken on approach. Await daylight to complete buoy work.
July 11 0000	Start hydrographic survey of Wilmington Canyon area to determine best location for tripod deployment, and to allow time to repair data logger. XBT and CTD observations.
1400	Select tripod site slightly north of head of Wilmington Canyon with smooth topography and relatively simple density structure. Deploy two surface markers Repairs on tripod data logger not complete
1600	Return to EB 41 site Deploy mooring with two current - transmissometer sensors Very difficult deployment due to close instrument spacing (USGS Mooring 133).
2200	Tripod repaired. Used data logger just recovered.
	On station for deployment. One surface buoy deployed in afternoon not on station [determined on later cruise that buoy tower removed, and thus not visible at night. Suspect fishing boat removed tower]. Deployed old surface buoy with old chain for second marker.
July 12 0020	Deploy tripod (Mooring 131)
0100	Underway. Continue XBT and CTD observations Wilmington Canyon and N. J. Shelf transects.
July 13 1100	Arrive Woods Hole Offload

Tabulated Information:

a. Days at sea	7
b. Number of hydrographic stations	217
XBT	121
CTD	88
Surface Salinity only	8

e. Instrumentation recovered 3

(1) Mooring 118 (2 current meters)
(Sta. A, Georges Bank 40° 51'N 67° 25' W)

(2) Mooring 122 (tripod)
(Sta. B, Mid-Atlantic 38° 43.5'N 73° 37.5'W)

(3) Mooring 126 (tripod)
(Sta. A, Georges Bank 40° 51'N 67° 25'W)

d. Instrumentation deployed 6

(1) Mooring 128 (3 current meters)
(Sta. A, Georges Bank 40° 51.2'N 67° 24.2'W)

(2) Mooring 129 (tripod)
(Sta. B, Mid-Atlantic 38° 43.5'N 73° 37.5'W)

(3) Mooring 130 (tripod)
(North side Georges Bank 41° 59.0'N 67° 47.0'W)

(4) Mooring 131 (tripod)
(Sta. C, Mid-Atlantic 38° 35.7'N 73° 26.2'W)

(5) Mooring 132 (tripod)
(Sta. A, Georges Bank 40° 51.2'N 67° 24.2'W)

(6) Mooring 133 (2 current meters with transmissometer)
(Sta. B, Mid-Atlantic 38° 43.5'N 73° 37.5'W)

Preliminary Data Analysis

The data from tripod Moorings 122 and 126, have been decoded and partially analyzed. Unfortunately, the current speed sensor on Mooring 122 failed. Otherwise, data quality appears good. The current meter records from Mooring 118, have been decoded and processed. Data quality is excellent. This mooring was deployed in Dec. 1976, and was in the water when the ARGO MERCHANT oil spill occurred. The current data should provide important information on the possible fate of the spilled oil.

The hydrographic observations have not been decoded or analyzed. Crude analysis of XBT temperature observations aboard ship suggested mixing in Great South Channel. Temperature section off N.J. showed a distinct cold pool.

Appendix

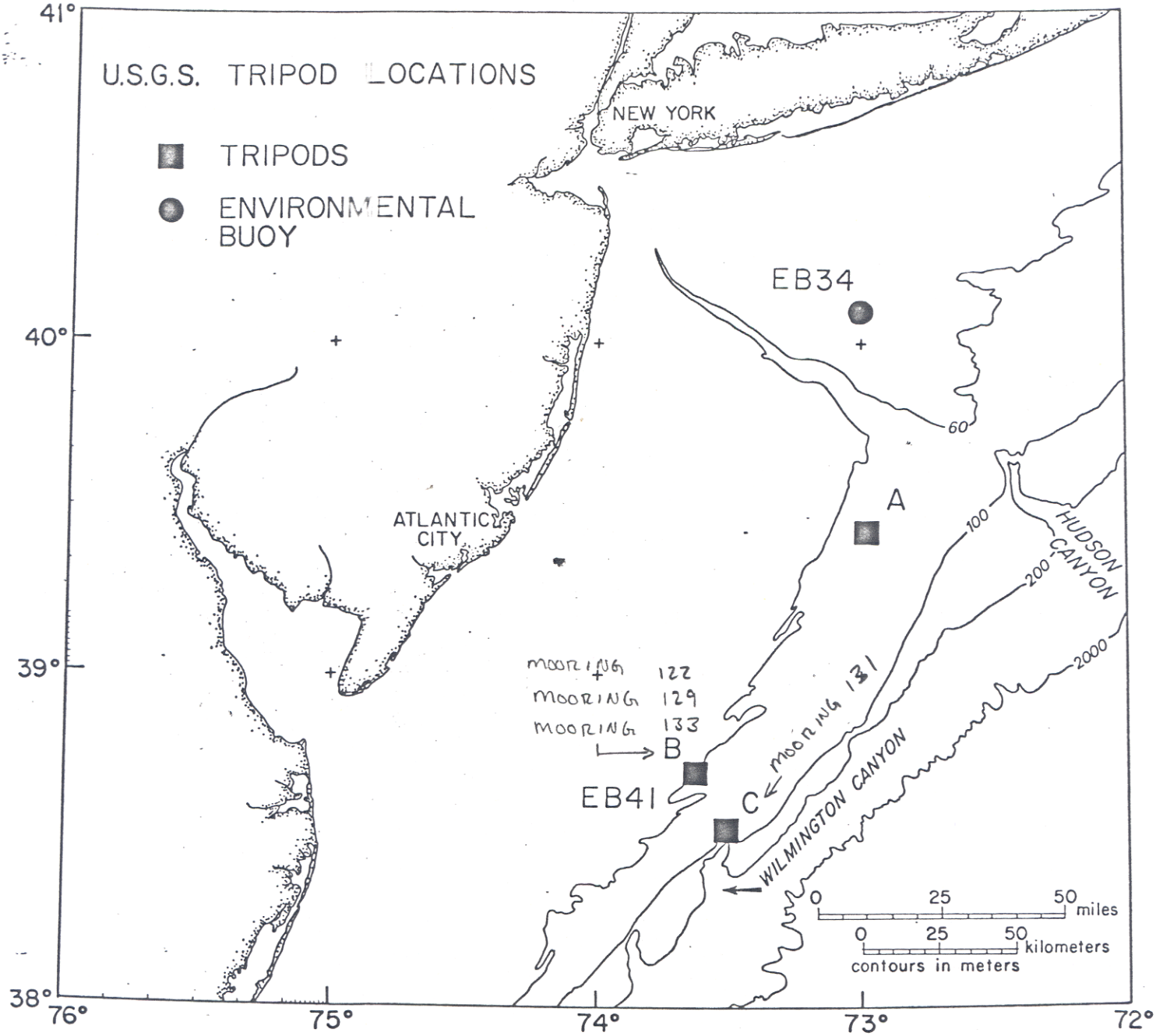

Fig. 1

Mooring locations, Mid Atlantic Shelf, OCEANUS 29 6-13 July 1977. Mooring 122 recovered at Station B. Moorings 129 and 133 deployed at Station B. Mooring 131 deployed at Station C.

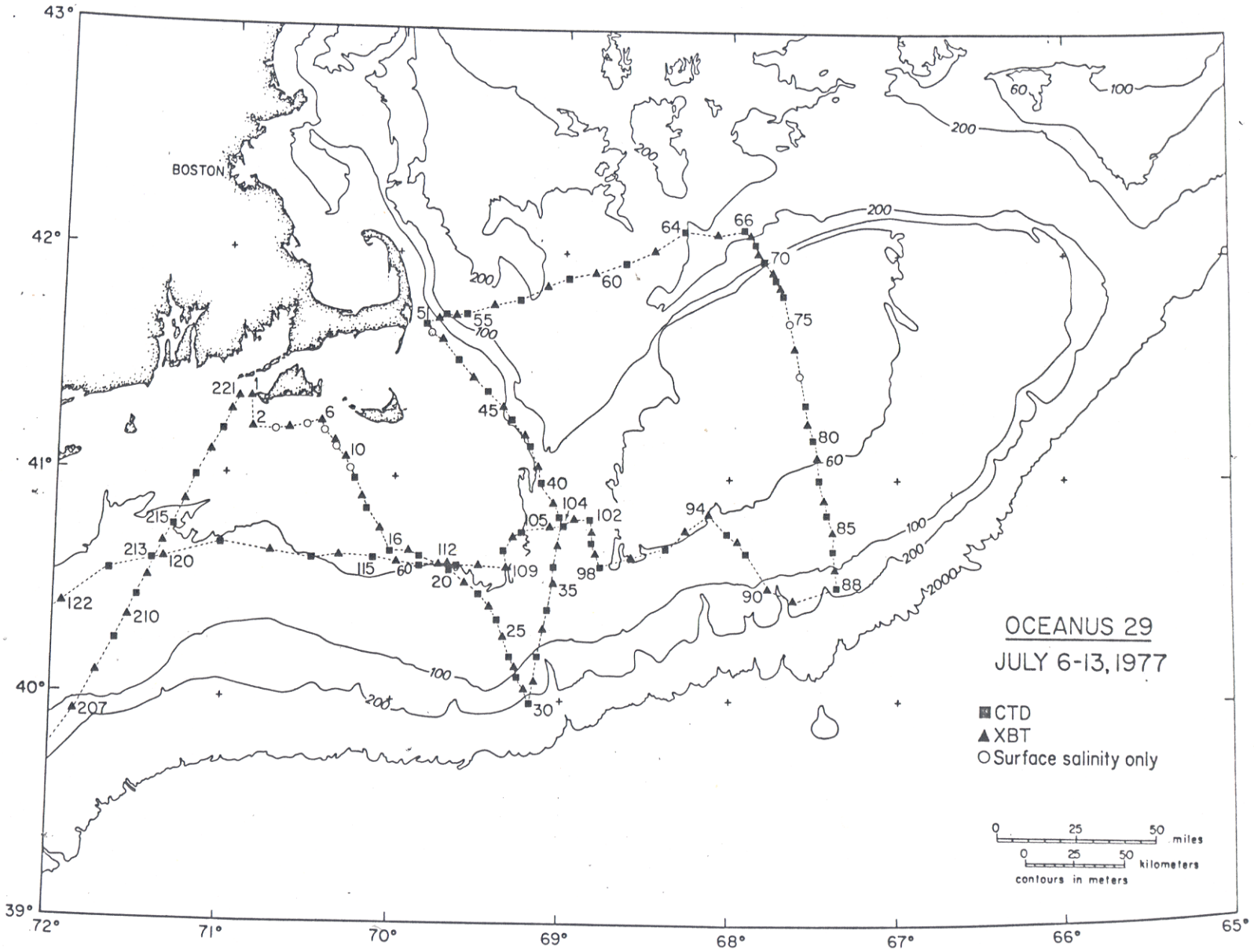

Fig. 2

Cruise Track R/V OCEANUS 6-13 July 1977

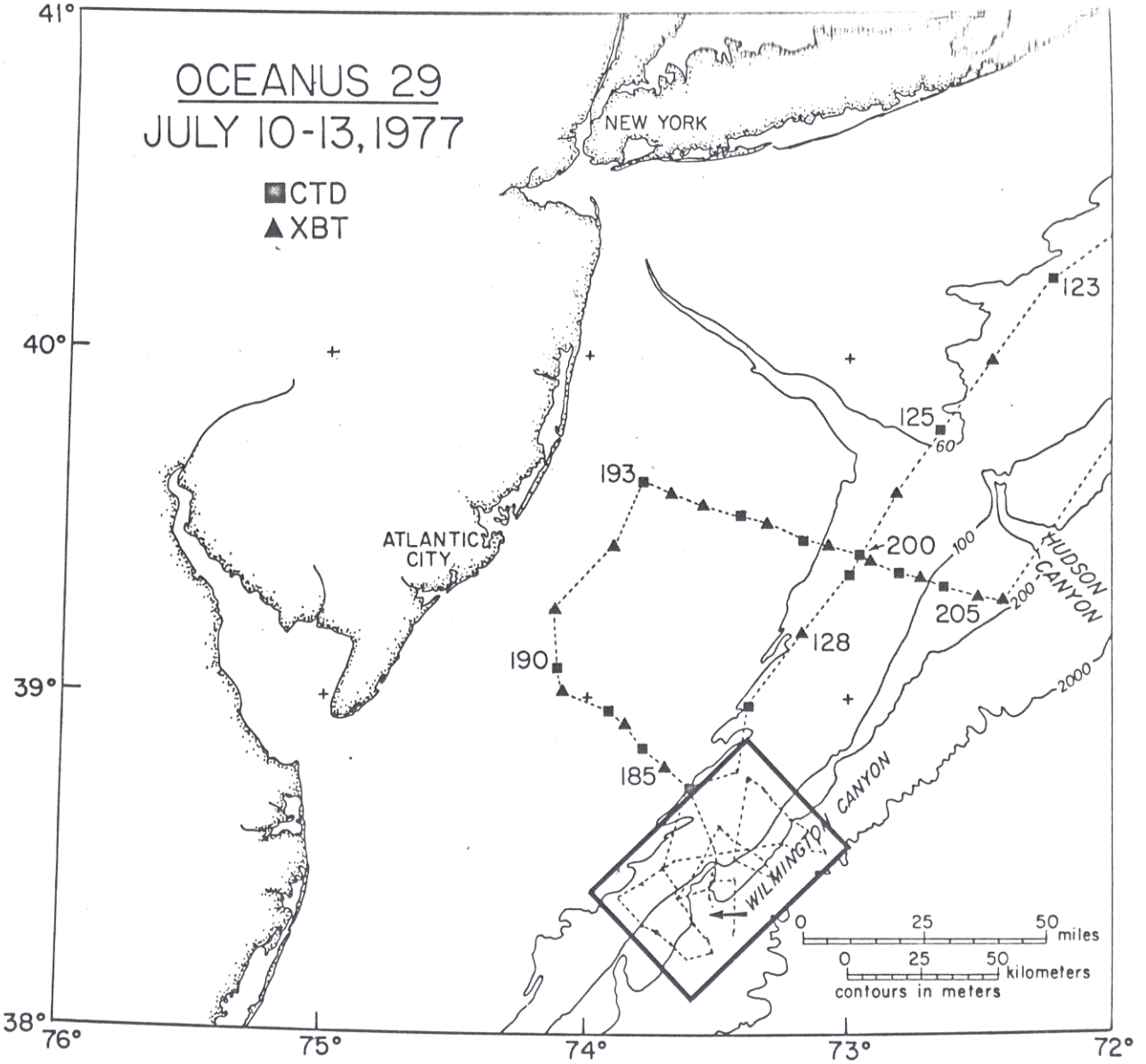

Fig. 3

Cruise Track R/V/ OCEANUS 6-13 July 1977

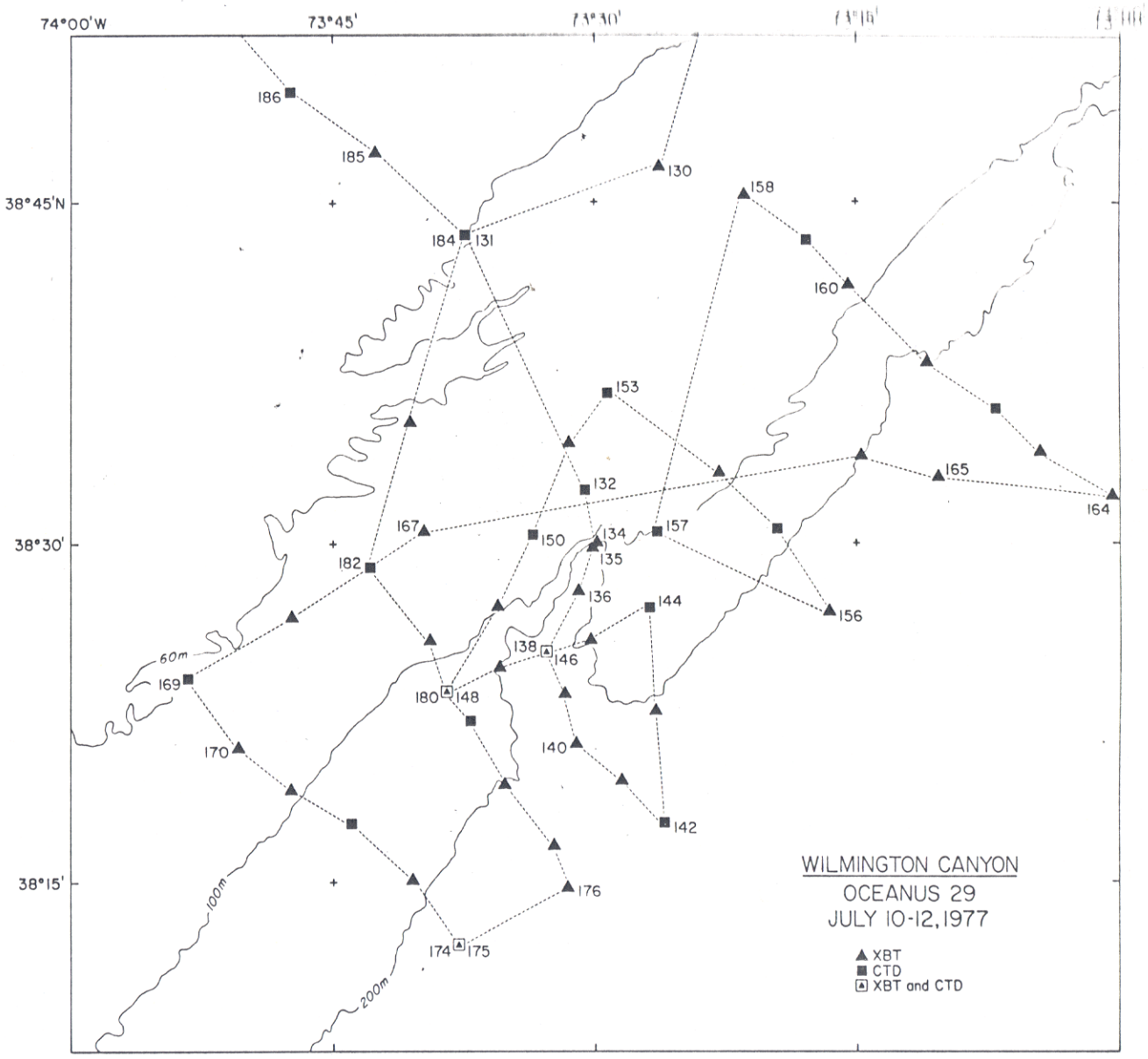

Fig. 4

Cruise Track R/V OCEANUS 6-13 July 1977

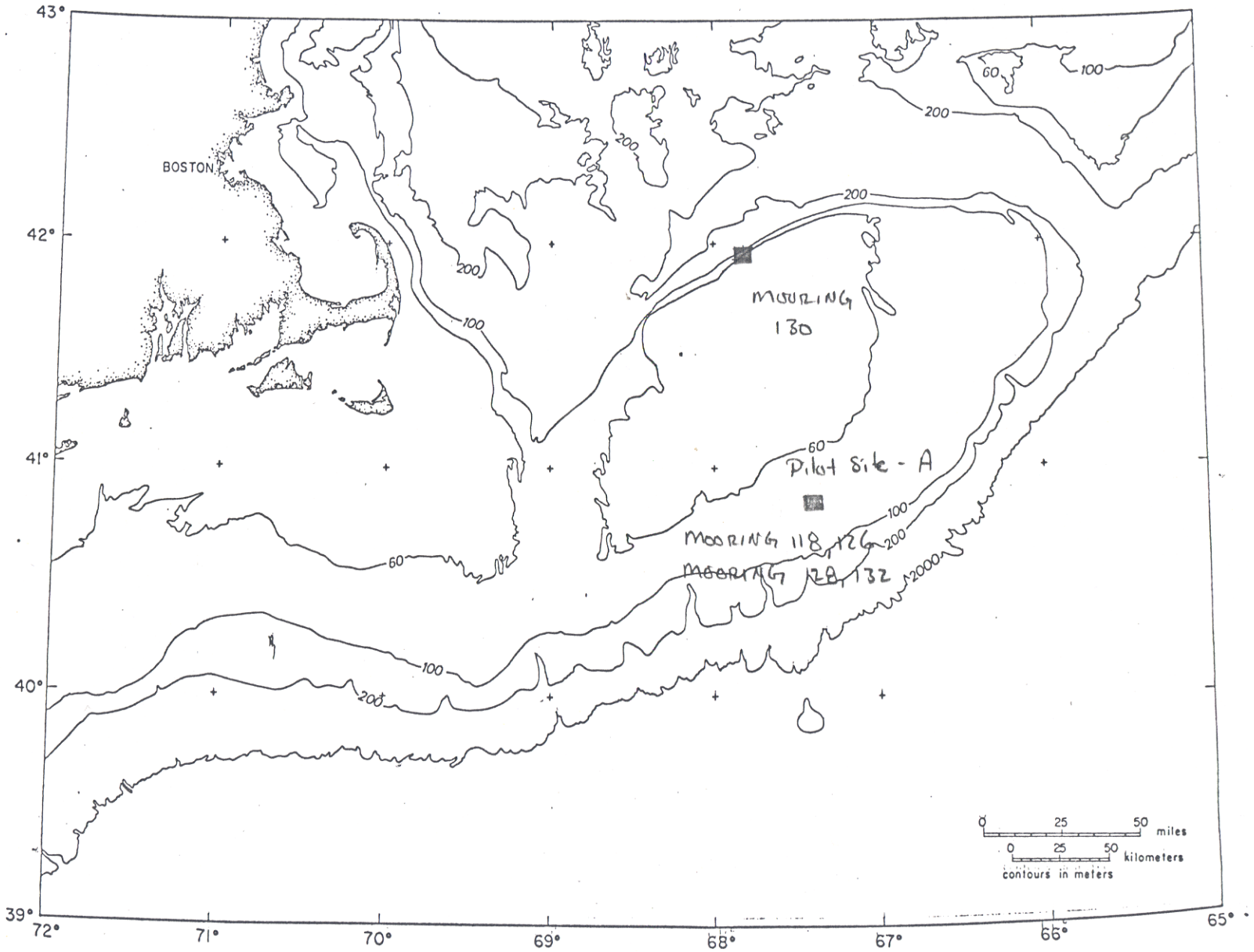

Fig. 5

Mooring locations, Georges Bank, Mooring 118 (current meter) and Mooring 126 (tripod) recovered at Station A. Mooring 128 (current meter) and 132 (tripod) were deployed at Station A. Mooring 130 was deployed on the borth side if the bank.

Station Procedure

Two types of water profiling and sampling stations were conducted on OCEANUS 29.

a. Expendable Bathythermograph Station (XBT).

Profiles of water temperature were obtained while underway using XBT's. At all XBT stations, a surface water sample was taken for surface salinity. Salinity bottles were rinsed at least twice prior to filling. [T4 (460m), T7 (760m), and T10 (220m) probes were used depending on water depth].

b. Conductivity - temperature - depth station (CTD)

Profiles of water temperature and conductivity were obtained using a Plessy 9040 CTD. At all CTD stations, a surface water sample was taken for surace salinity. Also at most stations, a Nansen bottle with reversing thermometers was used to obtain accurate temperature and conductivity pairs for CTD calibration.
Station procedures was as follows:

1. Read Loran C

2. Place CTD fish in water, lower to approximately three meters. Read frequency output of CTD.

3. Attach Nansen bottle with reversing thermometer to wire (bottle approximately five meters above fish sensors).

4. Lower fish to desired depth (to within 5 m of bottom where possible). Read frequency output of CTD.

5. Raise fish to desired level for calibration, generally a well mixed place in the water column, usually near bottom.

6. Allow fish and Nansen bottle to "soak" for 5 minutes. Trip bottle with messenger.

7. Raise fish 5 m and read frequency output of fish (fish at level of Nansen bottle when tripped).

8. Raise fish to 3 m of surface, remove Nansen bottle, read frequency output of CTD.

9. Remove fish from water.

10. Obtain surface salinity sample. Rinse sample bottle at least twice.

11. Let Nansen bottle thermometers equilibrate at least 15 minutes. Read reversing thermometer twice. Draw water sample, rinsing sample bottle at least twice.

The XBT and CTD water sampling and profiling stations were numbered consecutively (Table 1). Typically, XBT and CTD stations were alternated to obtain maximum information on the temperature structure (every 5 miles), with sufficient resolution of the salinity and density field (10 mi.). The XBT and CTD analog traces were used to determine depth of each isotherm. A plot of the temperature field was made aboard ship to aid in selecting sampling locations.

STATION LOCATIONS OCEANUS 29

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
1	41°21.3'	70°52.4'	20	✓		
2	41°11.9'	70°51.2'	27	✓		
3	41°12.5'	70°43.4'				✓
4	41°12.8'	80°38.5'	22	✓		
5	41°13.8'	70°32.0'				✓
6	41°15.4'	70°26.7'	22	✓		
7	41°12.3'	70°25.6'				✓
8	41°09.4'	70°22.2'	34	✓		
9	41°08.4'	70°21.7'				✓
10	41°05.1'	70°18.4'	35	✓		
11	41°02.0'	70°16.4'				✓
12	40°59.5'	70°14.4'	29		✓	
13	40°55.3'	70°11.1'	31	✓		
14	40°51.5'	70°09.0'	27.5		✓	
15	40°47.2'	70°04.7'	20	✓		
16	40°42.7'	70°01.2'	40		✓	
17	40°40.9'	69°55.4'	51	✓		
18	40°38.6'	69°50.5'	54		✓	
19	40°37.0'	69°44.4'	62	✓		
20	40°35.3'	69°39.6'	61		✓	
21	40°32.5'	69°34.4'	67	✓		
22	40°29.7'	69°29.3'	59		✓	
23	40°25.7'	69°25.5'	72	✓		
24	40°22.3'	69°22.8'	72		✓	

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
25	40°17.7'	69°20.4'	67	✓		
26	40°13.3'	69°18.4'	79		✓	
27	40°09.2'	69°16.0'	118	✓		
28	40°07.2'	69°15.5'	90.5		✓	
29	40°04.0'	69°12.5'	154	✓		
30	40°00.2'	69°10.4'	438		✓	
31	40°06.2'	69°09.6'	140	✓		
32	40°12.9'	69°07.5'	113		✓	
33	40°19.8'	69°05.7'	107	✓		
34	40°25.1'	69°04.9'	79		✓	
35	40°32.4'	69°03.6'	98	✓		
36	40°37.0'	69°03.1'	68		✓	
37	40°42.5'	69°02.8'	95	✓		
38	40°49.3'	69°00.4'	74		✓	
39	40°54.4'	69°03.0'	80	✓		
40	40°59.2'	69°07.7'	77		✓	
41	41°03.5'	69°08.8'	70	✓		
42	41°08.9'	69°12.5'	62		✓	
43	41°11.9'	69°14.5'	79	✓		
44	41°15.4'	69°16.9'	72		✓	
45	41°19.4'	69°20.6'	75	✓		
46	41°22.4'	69°24.6'	25		✓	
47	41°27.2'	69°32.5'	35	✓		
48	41°32.1'	69°37.6'	34		✓	
49	41°37.8'	69°43.8'	38	✓		

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
50	41°39.8'	69°47.3'				✓
51	41°41.6'	69°49.5'	23.5		✓	
52	41°42.5'	69°45.5'	65	✓		
53	41°43.5'	69°43.1'	88		✓	
54	41°43.4'	69°39.4'	140	✓		
55	41°44.5'	69°35.6'	149		✓	
56	41°46.9'	69°26.6'	88	✓		
57	41°48.6'	69°12.4'	186		✓	
58	41°51.3'	69°07.5'	208	✓		
59	41°53.1'	69°58.4'	151		✓	
60	41°55.6'	68°48.4'	137	✓		
61	41°58.2'	68°38.0'	163		✓	
62	42°01.3'	68°27.6'	168	✓		
63	No Station					
64	42°01.4'	68°17.0'	183		✓	
65	42°05.5'	68°04.5'	211	✓		
66	42°07.3'	67°54.5'	207		✓	
67	42°05.7'	67°52.6'	215	✓		
68	42°03.0'	67°51.0'	171		✓	
69	42°01.0'	67°49.5'	175	✓		
70	41°58.5'	67°47.2'	70		✓	
71	41°56.5'	67°44.7'	49	✓		
72	41°54.7'	67°43.1'	40		✓	
73	41°52.3'	67°41.9'	40	✓		
74	41°51.4'	67°40.6'	34		✓	

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
75	41°42.5'	67°38.7'	62			✓
76	41°35.8'	67°36.5'	57	✓		
77	41°28.4'	67°34.5'	25.5			✓
78	41°21.5'	67°32.9'	42.5		✓	
79	41°15.6'	67°32.4'	43.5	✓		
80	41°11.0'	67°29.5'	36		✓	
81	41°06.0'	67°28.9'	63	✓		
82	41°00.5'	67°27.6'	56		✓	
83	40°54.9'	67°26.0'	60	✓		
84	40°51.2'	67°24.9'	72		✓	
85	40°46.2'	67°23.7'	97	✓		
86	40°41.6'	67°23.4'	91.5		✓	
87	40°36.1'	67°21.9'	106	✓		
88	40°31.6'	67°20.4'	132		✓	
89	40°27.1'	67°36.8'	149	✓		
90	40°31.9'	67°46.0'	106	✓		
91	40°40.1'	67°53.4'	71		✓	
92	40°43.7'	67°57.5'	80	✓		
93	40°46.0'	67°01.4'	68		✓	
94	40°51.5'	67°08.2'	62	✓		
95	40°46.5'	68°15.4'	62	✓		
96	40°41.4'	68°22.6'	60		✓	
97	40°39.0'	68°35.3'	55	✓		
98	40°36.5'	68°47.1'	62.5		✓	
99	40°40.0'	68°48.6'	75	✓		
100	40°43.1'	68°48.5'	65		✓	

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
101	40°46.4'	68°49.1'	72	✓		
102	40°49.5'	68°49.6'	70		✓	
103	40°49.4'	68°55.3'	68	✓		
104	40°48.2'	68°59.9'	74		✓	
105	40°47.2'	69°04.6'	77	✓		
106	40°46.9'	69°14.0'	47		✓	
107	40°44.0'	69°17.0'	58	✓		
108	40°40.6'	69°20.0'	38		✓	
109	40°36.5'	69°19.9'	25	✓		
110	40°37.0'	69°29.0'	59	✓		
111	40°37.2'	69°37.2'	48		✓	
112	40°37.0'	69°41.6	29	✓		
113	40°37.7'	69°50.1	57		✓	
114	40°38.4'	69°58.6'	58	✓		
115	40°38.8'	70°07.2'	46		✓	
116	40°38.8'	70°19.5'	58	✓		
117	40°37.8'	70°29.6'	57		✓	
118	40°39.8'	70°44.2'	68	✓		
119	40°41.3'	71°00.5'	60		✓	
120	40°37.2'	71°22.1'	66	✓		
121	40°33.4'	71°40.5'	61		✓	
122	40°23.4'	71°57.4'	66	✓		
123	40°12.8'	72°13.0'	58		✓	
124	39°59.6'	72°27.2'	70	✓		
125	39°48.1'	72°39.2'	57		✓	
126	39°37.2'	72°49.5'	64	✓		

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
127	39°23.9'	73°00.0'	60		√	
128	39°11.4'	73°09.9'	68	√		
129	38°58.2'	73°23.1'	63		√	
130	38°46.7'	73°26.3'	42	√		
131	38°43.8'	73°37.5'	50		√	
132	38°32.5'	73°30.5'	81	√		
133	No Station					
134	38°30.0'	73°30.0'		√		
135	38°30.2'	73°30.1'	185	√		
136	38°27.8'	73°31.0'	437	√		
137	No Station					
138	38°25.2'	73°32.8'	740	√		
139	38°23.5'	73°31.7'	835	√		
140	38°21.2'	73°31.0'	820	√		
141	38°19.7'	73°28.5'	800	√		
142	38°17.6'	73°26.0'	800		√	
143	38°22.6'	73°26.5'	273	√		
144	38°27.3'	73°26.8'	97		√	
145	38°25.7'	73°30.2'	145	√		
146	38°25.2'	73°32.8'	740		√	
147	38°24.5'	73°35.4'	238	√		
148	38°23.4'	73°38.4'	101		√	
149	38°27.3'	73°35.6'	96	√		
150	38°30.3'	73°33.5'	75		√	
151	38°34.4'	73°31.5'	75	√		

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
152	No Station					
153	38°36.7'	73°29.3'	71		✓	
154	38°33.3'	73°22.6'	98	✓		
155	38°30.7'	73°19.6'	122		✓	
156	38°27.0'	73°16.5'	490	✓		
157	38°30.5'	73°26.5'	101		✓	
158	38°45.5'	73°21.5'	72	✓		
159	38°43.4'	73°17.9'	63		✓	
160	38°41.5'	73°15.4'	60	✓		
161	38°38.0'	73°11.2'	207	✓		
162	38°36.0'	73°07.2'	686		✓	
163	38°34.0'	73°04.6'	398	✓		
164	38°32.2'	73°02.9'	>715	✓		
165	38°33.1'	73°10.5'	702	✓		
166	38°33.9'	73°14.8'	219	✓		
167	38°30.5'	73°40.0'	79	✓		
168	38°26.7'	73°47.5'	64	✓		
169	38°24.2'	73°53.5'	62		✓	
170	38°21.0'	73°50.5'	72	✓		
171	38°19.2'	73°47.5'	97	✓		
172	38°17.8'	73°44.1'	109		✓	
173	38°15.1'	73°40.4'	140	✓		
174	38°12.9'	73°37.7'	480	✓		
175	38°12.9'	73°37.7'			✓	
176	38°14.7'	73°31.5'	>452	✓		

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
177	38°16.6'	73°32.4'	>488	✓		
178	38°19.4'	73°35.1'	203	✓		
179	38°22.2'	73°37.2'	108		✓	
180	38°23.5'	73°38.7'	100	✓		
181	38°25.7'	73°39.5'	90	✓		
182	38°29.2'	73°43.0'	56		✓	
183	38°35.6'	73°40.8'	63	✓		
184	38°43.3'	73°37.7'	60		✓	
185	38°47.4'	73°42.3'	52	✓		
186	38°50.7'	73°47.4'	46		✓	
187	38°55.0'	73°52.3'	52.5	✓		
188	38°57.9'	73°56.0'	38		✓	
189	39°01.3'	74°00.5'	39	✓		
190	39°04.6'	74°06.7'	30		✓	
191	39°15.5'	74°00.7'	32	✓		
192	39°27.0'	73°54.0'	30	✓		
193	39°38.0'	73°47.9'	24		✓	
194	39°36.4'	73°41.0'	35	✓		
195	39°33.9'	73°33.2'	40	✓		
196	39°32.0'	73°24.0'	24		✓	
197	39°30.7'	73°18.4'	35	✓		
198	39°28.3'	73°09.5'	40		✓	
199	39°27.4'	73°04.7'	60	✓		
200	39°26.0'	72°58.6'	53		✓	
201	39°24.5'	72°54.1'	68.5	✓		

Sta.	Latitude	Longitude	Depth	XBT	CTD	SSO
202	39°22.6'	72°46.0'	79		√	
203	39°21.5'	72°41.5'	100	√		
204	39°20.0'	72°35.3'	126		√	
205	39°18.7'	72°27.4'	142	√		
206	39°17.7'	72°21.5'	189	√		
207	39°56.5'	71°52.0'	109	√		
208	40°05.4'	71°45.4'	85	√		
209	40°14.5'	71°38.7'	81		√	
210	40°21.0'	71°34.5'	91	√		
211	40°27.4'	71°31.4'	71		√	
212	40°32.8'	71°27.5'	69	√		
213	40°36.7'	71°25.3'	53		√	
214	40°41.4'	71°22.2'	60	√		
215	40°46.0'	71°19.4'	48		√	
216	40°53.0'	71°14.8'	48.5	√		
217	40°59.0'	71°11.1'	42		√	
218	41°06.2'	71°06.6'	40	√		
219	41°11.9'	71°02.2'	33		√	
220	41°17.7'	70°59.0'	46	√		
221	41°20.1'	70°56.5'	45	√		

+4hrs

Vessel Oceanus

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LORAN LOG

Date	Time (+4)	Sta. (Cmt)	+/-.	Reading	Latitude (N)	Longitude (W)	Remarks
1977 7-06	1540				41°[illegible] N	70°[illegible] W	[illegible]
	1600	R+B	Numans	ϕ150 2.1mi	41°17.4	70°51.9	
	1627	SW Shoal		ϕ042 0.2mi	41°12.0	70°50.2	H/T S West Shoal Sta #10
	1630	2030	X Z	38-172.1 69-927.4	41°11.0	70°50.8	Fish over
	1710	2110	X Z	38-172.1 69-927.0	41°11.0	70°50.8	End Sta F/A 080°94.
	1644	2048	SAT	04/03	41°11.8	70°49.9	
	1730	213	X Z	38-122.2 69-935.5	41°12.5	70°43.6	
	1800	2200	MC Buoy	ϕ072 6.8mi	41°13.3	70°34.8	
	1810	2210	X Z	38-033.5 69-948.2	41°13.7	70°32.6	
	1833	2233	MC buoy	ϕ	40°14.6 010 0.3	70°26.7 mi	H/T MC buoy Sta #11
	1845	2245	R+B	ϕ004 0.5mi	41°15.0	70°26.5	begin Cast
	1900	2300	X Z	37-981.6 69-952.6	41°15.0	70°26.6	End Sta F/A 148°94
	1936	2336	X Z	37-995.4 69-991.2	41°08.4	70°21.2	
	2000	2400	X Z	38004.8 70019.0	41°03.5	70°17.3	
	2020	0020	X Z	38011.7 70040.7	40°59.6	70°14.1	Stopped Sta #12
	2102	0102	X Z	38020.4 70061.4	40°55.7	70°11.4	2044 End Sta #12 F/A
	2104	0104	DR		40°55.	70°11.0	2004 XBT #13
	2125	0125	X Z	38029.6 70085.3	40°51.5	70°0[illegible]3	Sta #14
							[illegible] End #14 - 12
	2210	0210		DR	40°46.5	70°05.1	Sta #15 XBT
	[illegible]	[illegible]	X Z	38042.8 70134.0	40°42.9	70°01.	Sta #16
	2332	0332		38034.0 70145.2	40°41.5	69°57.5	
	2359	0359	X Z	37993.6 70167.2	40°38.9	69°50.0	Sta #17

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Date	Time	Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7-07	0033	0433	X Z	37991.6 70165.9	40°39.0	69°50.1	END STA # 17
	0100	0500	X Z	37965.4 70182.4	40°37.1	69°44.4	XBT - STA # 18
	0119	0519	X Z	37942.4 70197.0	40°34.3	69°39.5	STA — 19
	0132	0532	X Z	37942.7 70196.5			END STA # 19
	0157	0557	X Z	37921.7 [illegible]	40°32.5	69°34.4	[illegible]
	0221	0621	[illegible]	[illegible]	40°29.6 [illegible]	69°28.5 [illegible]	[illegible] — 21
	0241	0641	"	" "	0052° 0.5mi		End Sta # 21
	0306	0706	X Z	37908.6 70254.4	40°25.7	69°25.7	XBT Sta # 22
	[illegible]	[illegible]	X Z	37915.6 70213.8	40°21.9	69°22.8	Sta # [illegible] 23
	0350	0750	X Z	37914.3 70273.6	40°21.9	69°22.7	End Sta # 23 F/A 158 GY.
	0344	0746	SAT	18/03	40°23.171	69°27.311	
	0410	0810		37-922.6 70-277.2	40°21.2	69°23.0	0415 XBT # 24
	0430	0830	X Z	37-935.4 70-306.6	40°15.2	69°19.5	
	0450	0850	X Z	37-950.6 70-321.6	40°12.0	69°18.0	H/T CTD STA # 25
	0500	0900	X Z	37-950.0 70-321.3	40°12.0	69°18.0	
	0519	0919	X Z	37-947.9 70-321.2	40°12.2	69°17.5	End STA # 25 F/A 156 GY
	0540	0940	X Z	37-957.8 70-340.1	40°09.5	69°15.6	
	0545	0945			40°07.4	69°15.0	XBT # 26
	0555						A/C 336 GY
	0600	1000	X Z	37-961.5 70-352.1	40°06.2	69°14.0	
	0611	1011	X Z	37-967.3 70-345.8	40°07.1	69°16.6	H/T STA # 27
	0635	1035	X Z	37-963.7 70-345.8	40°07.2	69°15.0	End STA # 27 F/A 156 GY
	0650	1050	X Z	37-964.8 70-356.6	40°05.1	69°13.1	
	0715	1115	X Z	37-984.2 70-381.4	40°00.0	69°11.0	H/T STA # 28
	0750	1150	X Z	37-980.9 70-380.7	40°00.3	69°10.5	End STA F/A 009 GY
	0849	1249	X Z	37866.2 70329.6	40°12.8	69°07.5	H/T STA # 29

Vessel Oceanus

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Date	+4 Time	GMT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7/07	0914	1314		DW	40°[illegible]	69°07.5	End Sta #[illegible] F/A
	1011	[illegible]	Y Z	37753.4 70[illegible]0.0	40°15.1	69°04.6	HT Sta #30
	1137	1537	Y Z	37[illegible] 70130.6	40°36.9	69°03	HT Sta #31
X	1200	1600	X Z	37654.7 70227.9	40°37.0	69°03.0	End Sta #31
	1223	1623	X Z	37[illegible] 70205.7	40°42.9	69°05.0	XBT - Sta #32
	1251	1651	Traffic	[illegible]	40°48.5 [illegible] 009°	69°00.2 0.6 [illegible]	Sta #33
	1318	1718	"	" " " "	Ø080°	150 ft	End Sta #33
	1340	1740	X Z	37526.2 70157.0	40°54.2	69°03.0	XBT Sta #34
	1357	1757	X Z	37515.9 70137.8	40°58.4	69°05.4	
	1401	1801	X Z	37517.7 70133.9	40°58.4	69°06.0	Sta #35
	1426	1826	X Z	37514.8 70130.5	40°59.6	69°06.5	End Sta #35
	1446	1846	X Z	37502.1 70109.7	41°03.7	69°09.0	XBT Sta #36
	1508	1908	X Z	37487.7 70084.1	41°08.5	69°12.6	Sta #37
	1536	1936	X Z	37483.8 7080.3	41°09.5	69°12.5	End Sta #37
	1548	1948	X Z	37478.3 70066.6	41°12.1	69°14.4	XBT - Sta #38
	1607	2007	X Z	37.472.1 70.049.0	41°15.2	69°17.3	H/T #39
	1630	2030	X Z	37-467.8 70-048.0	41°15.5	69°16.4	End Sta F/A 317° GY
	1650	2050	X Z	37-467.7 70-031.2	41°18.8	69°19.5	C/C 310° GY
	1700	2100	X Z	37-471.5 70-021.8	41°20.4	69°21.5	C/C 305° GY.
	1722	2122	X Z	37-489.7 70-006.2	41°22.5	69°26.5	H/T Sta #40
	1735	2135	X Z	37-490.5 70-007.2	41°22.4	69°26.5	End Sta F/A 317° GY.
	1800	2200	X Z	37-497.2 69-986.5	41°25.7	69°31.1	
	1840	2240	X Z	37500.0 69949.8	41°31.8	69°38.0	H/T Sta #41
	1853	2253	X Z	37-500.6 69-949.5	41°32.0	69°37.6	End Sta #41 F/A 317° GY.
	1915	2315	X Z	37-507.1 69-919.9	41°37.0	69°44.0	
	1930	2330	X Z	37-511.5 69-903.8	41°39.5	69°47.0	

Vessel Oceanus

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Date	Time	GMT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7TH	1955	2355	R+B	320 #6 BUOY 0.4 mi	41°41.4	69°49.4	H/T STA # 42
			x				2009 END #42 C/C 073 F/A
	2033	0033	x 2	37453.6 69886.4	41°43.4	69°43.2	H.T STA #43
	2109	0109					END STA #42 C/C 0[illegible] F/A
	2130	0130	x 2	37392.2 69899.2	41°44.5	69°36.	H.T STA #44
	2117	0217			41°44.3	69°34.7	END STA #44 2215 C/C 065 F/A
	2300	0300	x 2	37266.4 69901.1	41°48.3	69°22.5	C/C 080°T
	2319	0319	x 2	37229.9 69905.5	41°48.9	69°18	H.T STA #45
	2354			37232.3 69905.4	41°48.9	69°18.2	2400 C/C TO 073 END STA #45 F/A

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Date	Time	Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7-08-77	0040	[illegible]	X Z	37123.9 69909.6	41°51.6	[illegible]	[illegible] Sta #46 A/C 075°
	0109	[illegible]	X Z	37055.4 69914.8	41°53.1	68°58.5	H/T Sta #47
	[illegible]	[illegible]	X Z	[illegible] 69913.6	41°53.1	68°58.5	End Sta #47 XBT
	0215	0615	X Z	36977.7 69917.2	41°55.3	68°49.5	A/C 074°G, XBT Sta #48
	0255	[illegible]	X Z	[illegible] 69920.8	41°58.1	68°38.1	H/T Sta #49
	0337	0737	X Z	36864.5 69919.6	41°58.5	68°37.8	End Sta #49 A/C 077° XBT
	0405	0805	X Z	36-784.5 69-925.1	42°00.2	68°28.1	
	0430	0830	X Z	36-717.6 69-930.7	42°01.5	68°20.5	
	0445	0845	X Z	36-696.4 69-929.6	42°02.0	68°18.3	H/T STA # 51
	0515	0915	X Z	36-697.6 69-929.5	42°02.2	68°18.4	End STA F/A 073° GY
	0545	0945	X Z	36-620.7 69-931.2	42°04.4	68°10.6	C/C 077° GY
	0600	1000	X Z	36-580.4 69-934.0	42°05.0	68°05.5	
	0630	1030	X Z	36-498.2 69-938.0	42°06.9	67°56.1	C/C 068° GY
	0635	1035	X Z	36-486.1 69-938.2	42°07.2	67°54.9	H/T STA # 52
	0710	1110	X Z	36-483.3 69-936.9	42°07.5	67°55.0	F/A 146° GY End STA
	0730	1130	X Z	36-483.1 69-952.3	42°04.6	67°52.0	
	0740	1140	X Z	36-484.6 69-959.9	42°03.0	67°50.7	H/T STA # 53
			SAT				
	~~0810~~	~~1210~~	X Z	~~36479.3 69949.8~~	~~42°05.4~~	~~67°52~~	0816 End STA # 52 F/A
	0824	1224	X Z	36479.7 69966.4	42°01.7	67°49	0826 C/C 157° T
	0830			36487.7 69980.8	41°59.0	67°47	0839 Stopped STA # 54
	0938 0906	1338	SAT	12/3	41°59.307	67°46.656	End STA # 54 C/C Y/S
	0976		X Z	36483.8 69968.5			ANC. OVER
	0854	1254		18° 4	41°58.388	67°49.007	
	1002	1402	X Z	36482.2 69978.7	41°59.4		BUOY CLOSE ABD
			Y	[illegible]		67°47.1	

Vessel Oceanus

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LORAN LOG

Date	Time (+4 GMT)	Sta.	+/-.	Reading	Latitude (N)	Longitude (W)	Remarks
07/06	1032	1432	X Z	36483.5 69979.2	41°-9.3		[illegible]
			Y	[illegible]		[illegible]	1117 c/c 150°T F/A
	1136	1536	X Z Y	44400 70000.1 [illegible]	41°55.0	67°14.0	H T STA [illegible]
	1153	1553	X Z	36493.5 70001.4	41°54.9	67°44.0	End Sta # 54
X	1200	1600	X Z	36494.2 70003.8	41°54.0	67°43.5	Noon Fix
	1210	1610	DR		41°52.2	67°41.5	XBT Sta # 55
	1218	1618	X Y	36490.5 70017.8	41°50.9	67°40.5	H/T Sta # 56
	1238	1638	X Y	36492.9 70001 7.2	41°50.9	67°40.7	End Sta # 56 A/C 166°C
	1300	1700	X Y	36520.1 70034.9	41°47.0	67°40.0	A/C 162°C
	1320	1720	X Y	36541.9 70053.2	41°42.7	67°39.0	Surf Velocity Sta # 57 A/C 162°
	1355	1755	X Y	36575.3 70084.1	41°35.4	67°36.5	XBT Sta # 58 A/C 166°C
	1434	1834	X Y	36615.2 70116.9	41°27.7	67°34.8	Surf Velocity Sta # 59
	1508	1908	X Y	36651.3 70144.8	41°20.8	67°32.7	H/T Sta # 60
	1528	1928	X Y	36648.5 70142.1	41°20.5	67°32.7	End Sta # 60
	1555	1955	DR				XBT # 61
	1600	2000	X Z	36-684.3 70-167.6	41°15.4	67°32.2	
	1626	2026	X Z	36-697.7 70-185.5	41°11.2	67°30.0	H/T # STA. 62
	1647	2047	X Z	36-694.9 70-183.8	41°11.6	67°29.7	End STA # 62 F/A 170°CY
	1706	2106	X Z	36-712.4 70-196.7	41°08.5	67°29.1	
	1730	2130	X Z	36-741.9 70-218.5	41°03.3	67°28.0	
	1744	2144	X Z	36-755.4 70-229.1	41°00.8	67°27.5	H/T STA # 63
	1808	2208	X Z	36-753.5 70-228.2	41°01.0	67°27.5	End STA F/A 170°CY
	1830	2230	X Z	36780.0 70249.5	40°56.0	67°26.2	XBT - Sta # 64
	1900	2300	X Z	36-798.6 70-268.5	40°51.4	67°24.3	H/T STA # At buoy STA

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Date	Time	Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7-09-77	0132	0532	X Y	36979.3 70268.8			Current meter ↑ over
	0219	0619	X Y	36796.1 70267.8	40°51.5	67°24.3	End Buoy servicing
	0250	0650	X Y	36830.8 70289.8	40°46.1	67°24.0	
	0314	0714	X Y	36859.8 70308.0	40°41.6	67°22.8	Sta # 65
	0342	0742	X Y	36855.4 70305.6	40°41.1	67°22.6	End Sta #65 A/C 170°G
	0403	0703	X Y	36877.4 70321.3	40°38.2	67°22.5	A/C 165°G
	0437	0837	X Z	36-908.8 70-349.8	40°31.5	67°20.3	H/T STA #66
	0508	0908	X Z	36-908.6 70-348.8	40°31.6	67°20.5	End STA F/A 251°GY
	0530	0930	X Z	36-970.4 70-348.6	40°30.4	67°27.2	C/C 246°GY
	0600	1000	X Z	36-066 70-352	40°27.0	67°36.6	C/C 316°GY Fog Sigs BEGUN XBT #67
	0630	1030	X Z	37-081.3 70-331.1	40°31.4	67°42.5	
	0649	1049					XBT #68
	0700	1100	X Z	37-092.7 70-307.2	40°36.0	67°48.7	
	0654	1054	SAT	41°/4	40°34.8	67°47.2	
	0716						C/C 324°T
	0730	1130	X Z	37-099.5 70-286.4	40°40.0	67°53.3	H/T STA #69
	0753	1153	X Z	37-099.5 70-286.4	40°40.0	67°53.3	End STA F/A 316°GY
		1206	SAT	06°06	40°44'748	67°53'147	
	0837	1237		37117.6 70254.7	40°46.5	68°01.	H.T STA #70
	0934	1234	X Z	37126.6 70227.9	40°51.5	68°08	C/C 231°T XBT
	1000	1400	X Z	37200.0 70237.4	40°47.7		
				49269.6		68°13.9	
	0958	1358	SAT	50°03	40°48'066	68°16'218	
	1040	1440	X Z Y	37315.8 70253.6 49302.0	40°41.4	68°23.0	H.T. STA #71
	1112						End STA #71 C/C 257°F/A
	1130		X Z Y	37356.4 70253.3 49306.4	40°40.5	68°27.2	

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Date	Time	GMT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7-22	1233	1633	X Y	37440.8 70251.9	40°38.5	68°36.8	A/C 260°C
	1234	1634	X Y	37535.0 70249	40°37.6	68°47.4	H/T Sta #72
	1238	1638	X Y	37540.9 70249.9	40°36.4	68°47.5	End Sta #72 A/C 354°
	1315	1715	X Y	37520.9 70233.1	40°40.1	68°48.5	A/C 005°C
	1328	1728	X Y	37497.9 70281.2	40°43.1	68°48.3	Sta #73
	1352	1752	X Y	37498.0 70219.3	40°43.6	68°48.1	End Sta #73
	1420	1820	X Y	37460.5 70192.3	40°49.3	68°49.5	Sta #74
	1439	1839	X Y	37459.6 70191.0	40°49.5	68°49.5	End Sta #74 A/C 255°C
	1517	1917	X Y	37547.3 70185.6	40°48.2	69°00.0	Sta #75
	1536	1936	X Y	37549.4 70185.0	40°48.4	69°00.0	End Sta #75
	1601	2001	X Z	37-616.6 70-181.7	40°47.1	69°07.3	
	1625	2025	X Z	37-664.1 70-175.6	40°46.8	69°14.0	H/T Sta #76
	1641	2041	X Z	37-662.8 70-175.0	40°47.0	69°13.8	End Sta H/A 218
	1700	2100	X Z	37-707.4 70-183.2	40°44.1	69°17.4	XBT #77
	1720	2120	X Z	37-756.3 70-195.3	40°40.5	69°20.4	H/T Sta #78
	1755	2155	X Z	37-757.0 70-195.0	40°40.6	69°20.6	End Sta Vessel maneuvering
	1824	2224	X Z	37-783.8 70-212.8	40°36.5	69°20.0	around traffic various courses
	1830	2230	X Z	37-799.3 70-216.5	40°35.7	69°21.0	
	1836						A/C 281°C
	1850		[illegible]				
	1900	2300	X Z	37-857.8 70-205.9	40°35.6	69°29.2	
	1930	2330	X Z	37-906.4 70-190.7	40°37.2	69°37.2	H/T Sta #79
	1950	2350	X Z	37-907.5 70-190.0	40°37.1	69°37.3	End Sta H/A 275 qy
	2000	0000	X Z	37923.0 70186.8	40°37.3	69°39.6	
	2020	0020	X Z	37980.6 70175.4	40°37.1	69°47.4	
	2043	0043	X Z	38001.4 70171.0	40°37.7	69°50.4	H.T Sta #80

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Date	+4 Time	GMT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7/9	2130	0130	X Z	38055.5 70158.2	40°38.3	69°58.5	#80 2102 FWD STA [illegible] F/A
	2200	0200	X Z	38116.5 70148.0	40°38.7	70°07	H.T STA #81
	2216	0216					F/A FWD STA #81 c/c 270°
	2300	0300	X Z	38214.0 70126.4	40°39.0	70°20.1	
	2331	0331	X Z	38282.7 70113.7	40°38.9	70°30.1	H.T. STA # 82
	2345						F/A FWD STA #82 c/c 276
	0006	0406	X Z	38313.0 70106.3	40°39.3	70°34.4	

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Date	Time	UCT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7-10-77	0030	0430	X Z	38366.4 70091.4	40°39.6	70°42.5	A/C 277°6
	0038	0438	X Z	38380.5 70088.2	40°39.7	70°44.3	XBT - Sta #83
	0100	0500	X Z	38420.4 70073.5	40°40.5	70°51.7	
	0123	0528	X Z	38483.2 70057.6	40°41.2	71°00.3	H/T Sta #84
	0142	0548	X Z	38483.9 70058.1	40°41.7	71°00.0	End Sta #84 A/C 257°
	0230	0630	X Z	38554.3 70060.7	40°39.7	71°08.6	
	0300	0700	X Z	38629.3 70043.8	40°38.3	71°17.4	
	0316	0716	X Z	38671.4 70040.2	40°37.1	71°22.2	XBT - Sta #85
	0400	0800	X Z	38 785.8 70 029.6	40°34.5	71°35.8	
	0423	0823	X Z	38 827.7 70 024.0	40°34.0	71°40.7	H/T STA #86
	0440	0840	X Z	38 029.6 70 024.2	40°33.9	71°41.2	End STA F/A 230°T
	0500	0900	X Z	38 886.3 70 031.0	40°31.0	71°45.6	
	0530	0930	X Z	38 974.3 70 042.3	40°26.4	71°52.8	0545 XBT #87
	0600	1000	X Z	39 064.0 70 053.7	40°21.5	72°00.5	
	0630	1030	X Z	39-151.8 70-065.2	40°16.7	72°07.2	
	0655	1055	X Z	39-074.1 70-226.9	40°12.8	72°13.5	H/T STA #88
	0700	1100	X Z	39-074.1 70-226.9	40°12.8	72°13.5	
	0715	1115	X Z	39 233.0 70-073.7	40°12.5	72°14.5	End STA F/A 217
	0736	1136	X Z	39 290.4 70 085.8	40°09.0	72°18.2	
	0805	1205	X Z	39377.7 70105.7	40°03.3	72°24.1	
	0900	1300	X Z	39544.3 70145.0	39°52.2	72°35.	
	0922	1322	X Z	39609.2 70159.4	39°48.1	72°39.5	H.T. STA #89
	0923	1323					End #89 C/C 214° F/A
	1000	1400	X Z	39696.0 70178.8	39°42.6	72°45.5	1003 C/C 210°T
	1030	1430	X Z	39784.0 70203.7	39°36.1	72°50.7	
	1100	1500	X Z	39872.2 70228.9	39°30.	72°56	

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Date	Time (+4 GMT)	Sta.	+/-.	Reading	Latitude (N)	Longitude (W)	Remarks
7/10	1131	1533	X Z	39954.7 70056.3	39°23.5	73°00.0	H.T. STA #90
	1200	1600	X Z	39998.1 70265.4			1145 END STA #9[illegible]
	1200	1600	X Z	39998.1 70265.4	39°21.0	73°03.5	A/C 212°C.
	1303	1703	X Z	40182.6 70315.5	39°08.5	73°15.1	A/C 205°C
	1330	1730	X Z	40260.3 70340.9	39°03.0	73°20.0	A/C 197°C
	1357	1757	X Z	40327.3 70361.7	38°58.0	73°23.4	H/T Sta #91
	1419	1819	X Z	40330.9 70360.3	38°57.9	73°24.0	End Sta #91 A/C 188°C.
	1500	1900	X Z	40433.3 70406.9	38°48.9	73°27.5	A/C 155°C.
	1516	1916	X Z	40446.3 70428.2	38°45.8	73°25.9	XBT-Sta #92 A/C 257°C.
	1530	1930	X Z	40481.0 70427.0	38°45.0	73°29.3	
	1605	2005	X Z	40-549.9 70-420.1	38°43.5	73°37.7	H/T STA 92
	1625	2025	X Z	40-553.1 70-418.5	38°43.5	73°38.5	END WATER STA - BEGIN TRIPOD OPERATIONS
	1700	2100	VESSEL MANEUVERING FOR RECOVERY				VARIOUS CS +SPDS
	1800	2200	X Z	40-552.2 70-419.4	38°43.5	73°38.4	TRIPOD Abd
	1900	2300	X Z	40 550.3 70 421.3	38°43.8	73°37.0	
	1950	2350	W Y	16-319.7 51 790.5	38°43.0	73°37.4	TRIPOD OVER
	2030	0030	W Y	16317.0 51802.3	38°40.5	73°35.5	2015 C/C 152° F/A
	2100	0100	W Y	16309.7 51833.2	38°34.2	73°31.2	
	2355	0355	W Y	16305.7 51842.3	38°31.9	73°29.1	H.T

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Date	Time	Sta.	+/-.	Reading	Latitude N	Longitude W	Remarks
7-11-77	0058	0458	W Y	16306.2 51843.6	38°32.0	73°30.0	Sta #93
	0121	0521	Y Z	51843.8 70498.2	38°32.0	73°30.1	End Sta #93 S/C 197°C
	0150	0550	Y Z	51882.5 70517.6	38°29.2	73°32.0	A/C 070°S
	0210	0610	Y Z	51855.3 70518.8	38°29.2	73°30.3	~~XBT Sta #95~~ missed
	0226	0626	Y Z	51864.5 70515.1	38°30'	73°30	XBT - Sta #95
	0246	0646	Y Z	51889.6 70526.1	38°27.6	73°31.5	XBT - Sta #96
	0311	0711	Y Z	51925 70540.3	38°25.0	73°32.6	XBT - Sta #97 bad
	0317	0717	Y Z	51927.7 70540.7	38°25.0	73°32.6	XBT Sta #97
	0331	0731	Y Z	51936.2 70550.6	38°23.2	73°32.0	XBT - Sta #98
	0348	0748	Y Z	51950.3 70565.0	38°21.0	73°31.2	XBT - Sta #99
	0410	0810	Y Z	51-950.0 70-578.0	38°19.5	73°28.5	XBT - # 100
	0430	0830	Y Z	51 950.1 70 594.2	38°17.4	73°26.5	H/T CTD # ~~101~~ 94
	0510	0910	Y Z	51 955.3 70 594.3	38°17.5	73°26.7	END STA H/A 000
	0530	0930	Y Z	51 921.8 70 572.5	38°20.3	73°25.5	
	0600	1000	Y Z	51 869.6 70 539.1	38°27.0	73°26.7	H/T STA # ~~102~~ 95
	0625	1025	Y Z	51 869.7 70 536.7	38°27.0	73°27.0	End STA F/A 238°94
	0640	1040	Y Z	51 900.0 70 540.0	38°25.8	73°29.5	XBT # 103
	0650	1050	Y Z	51 -924 70 754	38°25.0	73°32.7	H/T STA # ~~104~~ 96
	0725	1125	Y Z	51 930.1 70 540.0	38°25.0	73°33.1	End STA F/A 252°64
	0747	1147	Y Z	51 976.4 70 539.2	38°23.5	73°28.5	H/T STA # ~~105~~ 97
	0805	1205					END STA 105 C/C 030 F/A
	0844	1244	Y Z	51882.2 70506.6	38°30.5	73°33.6	H.T STA # ~~106~~ 98
	09	13					0907 END STA # 98 ~~106~~ F/A
	0943	1343	Y Z	51798.9 70476.5	38°26.7	73°28.9	STOPPED STA # ~~100~~ 99
	1017						END STA # 99 ~~100~~ C/C 134° F/A
	1028						C/C 118°T

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Date	Time (+4)	Sta. (GMT)	+/-.	Reading	Latitude (N)	Longitude (W)	Remarks
7/11	1037	1437					1037 C/C [illegible] T
	1043	[illegible]					C/C 134°T
	1104	1504	X Z	51788.4 70[illegible]	38°30.7	73°19.3	H.T. STA #10 D
X	1128	1528					[illegible] D F/A
	1149	1549	W Z	16290.1 70551.6	[illegible]	[illegible]	C/C [illegible] T
	1200	1600	W Z	16294.0 70543.6	38°28.4	73°19.2	
	1228	1628	W Z	16300.9 70519.9	38°30.4	73°25.0	H/T Sta #101
	1245	1645	W Z	16301.5 70518.3	38°30.2	73°25.1	Ends Sta 101 A/C 357°C
	1258	1658	X Z	40557.1 70500.0	38°33.5	73°26.5	A/C 000°C
	1309	1709	W Z	16306.0 70483.8	38°36.2	73°26.0	H/T ▽ Sta
	1400	1800	W Z	16305.4 70485.9	38°35.8	73°26.0	▽ #1
	1432	1832	W Z	16305.3 70485.3	38°35.9	73°25.9	▽ #2 A/C 310°C
	1500	1900	X Z	51780.6 70450.4	38°40.3	73°32.1	A/C 303°C
	1530	1930	W Z	16319.6 70420.5	38°44.0	73°36.6	H/T @ ▽ Sta
	1630	203	VARIOUS COURSES MANEUVERING				TO SET CURRENT METERS
	1657	2057	W Z	16319.2 40549.0	38°42.8	73°37.0	LAUNCHED CURR. METERS
	1745	2145	W Z	16319.6 40548.8	38°43.0	73°37.1	F/A 076°94
	1820	222	W Z	16312.2 40447.0	38°45.5	73°25.6	
	1842	2242	W Z	16309. 40415.7	38°46.2	73°22.0	A/C 130°C
	1900	2300	W Z	16304.1 40411.5	38°43.3	73°17.5	H/T STA #102
	1920	2320	W Z	16304.0 40412.0	38°43.3	73°17.5	END STA F/A 130°94
	1930	2330	W Z	16300.3 40408.9	38°41.0	73°14.6	
	1935						XBT #111
	1950	2350	W Z	16294.5 40408.6	38°38.0	73°11.0	XBT #112 C/C 119°T
	2000	0000	W Z	16291.0 40402.0			
	2008	0008	W Z	16289.2 40396.6	38°35.9	73°06.7	HT STA #103

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Date	Time (+4)	Sta. (GMT)	+/-.	Reading	Latitude (N)	Longitude (W)	Remarks
7/11	2407	0102	W X	16282.2 40294.9	38°32.5	73°02.5	C/U 281°
	2131	0131	W X	16288.8 40329.5	38°37.5	73°09.5	
	2200	0206	W X	16296.4 40462.1	[illegible]	73°16.8	
7/12	0007			16305.5 40537.6			[illegible]
	0020			51787.7 70486.5			TRIPOD [illegible]

Vessel [illegible]

Cruise 2?

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Date	Time	Sta.	+/-.	Reading	Latitude	Longitude	Remarks
7-12	0117	0517	Z X	70 405.5 40559.2	38°35.1	73°29.0	A/C 243°G
	0130	0530	X Z	40600.0 70490.2	38°33.3	73°32.5	
	0200	0600	X Z	40683.7 70496.9	38°30.0	73°40.5	
	0209	0609	X Z	40713.2 70500.0	38°28.8	73°43.0	XBT - Sta # 112
	0230	0630	X Z	4777.2 70505.6	38°26.2	73°49.1	
	0245	0645	X Z	40822.7 70508.8	38°24.4	73°53.5	H/T Sta # 104
	0307	0707	X Z	40828.0 70508.2	38°24.3	73°54.4	End Sta #104 A/C 129°G
	0330	0730	X Z	40827.8 70534.5	38°20.9	73°50.5	XBT - Sta # [illegible]
	0358	0758	X Z	40808.6 70565.4	38°18.8	73°44.0	H/T Sta #105
	0430	0830	X Z	40 808.6 70 565.0	38 18.8	73 44.0	End STA F/A 132 GY
	0502	0902	X Z	40 805.3 70 602.5	38 13.0	73 38.2	C/C 124 GY
	0520	0920	X Z	40 800.0 70 620.5	38 10.9	73 34.5	H/T STA # 106
	0550	0950	X Z	40 801.0 70 619.8	38 11.0	73 35.0	End STA F/A 043 GY
	0600	1000	X Z	40 776.4 70 613.0	38 13.0	73 32.3	
	0614	1014					C/C 326 GY
	0645	1045	X Z	40 726.1 70 558.0	38 21.1	73 36.5	
	0655	1055	X Z	40 724.7 70 549.2	38 22.2	73 37.6	H/T STA # 107
	0720	1120	X Z	40 723.3 70 548.1	38 22.5	73 37.5	End STA F/A 326 GY
	0755	1155	X Z	40 707.6 70 500	38 29.0	73 42.6	H/T # 108
	0815						END STA # 108 C/C 012° F/A
	0925	1325	X Z	40549.8 70421.3	38°43.1	73°37	HT STA # 109
	0943	1323					END STA #109 C/C 312° F/A
	1003	1403	X Z	40547.9 70390.5	38°47.5	73°42.2	
	1029	1429	X Z	40555.7 70359.7	38°50.5	73°47.4	HT STA # 110
	1048	1443					END STA C/C 312° F/A
	1134	1534	X Z	40552.8 70298.5	38°58.	73°56.0	HT STA # 111

Vessel [illegible]

Cruise [illegible]

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Page [illegible]

Date	Time	Sta.	+/-.	Reading	Latitude	Longitude	Remarks
	1152	1552	X Z	40547.6 70297.1	38°58.1	73°55.9	End Sta #111 A/C 306°C.
	1200	1600	X Z	40547.2 70224.8	38°59.3	73°57.5	
	1230	1630	X Z	40559.5 70247.0	39°03.7	74°04.4	
	1240	1640	X Z	40565.8 70235.8	39°04.5	74°06.5	H/T Sta #112
	1250	1650	X Z	40564.5 70235.7	39°04.5	74°06.5	End Sta #112 A/C [illegible]
	1300	1700	X Z	40534.3 70222.5	39°07.2	74°05.6	A/C 025°C.
	1330	1730	X Z	40453.3 70192.5	39°13.4	74°01.7	A/C 023°C.
	1400	1800	X Z	40368.7 70160.2	39°22.6	73°57.4	
	1430	1830	X Z	40285.7 70127.7	39°27.5	73°53.8	A/C 020°
	1500	1900	X Z	40203.3 70094.3	39°34.2	73°50.5	
	1515	1915	X Z	40157.9 70077.6	39°38.0	73°48.3	H/T Sta #113
	1537	1937	X Z	40153.0 70077.0	39°38.1	73°47.8	End Sta #113 A/C 112°C
	1600	2000	X Z	40124.6 70105.0	39°36.2	73°40.5	
	1635	2035	X Z	40- 105.5 70- 121.0	39°34.8	73°36.5	XBT
	1700	2100	X Z	40 080.8 70 150.9	39°32.5	73°29.3	C/C TO 101° MAGNETIC
	1718	2118	X Z	40 048.7 70 164.4	39°31.5	73°23.6	H/T STA #114
	1735	2135	X Z	40 046.5 70 165.1	39°31.8	73°23.5	End STA F/A 119 MAG.
	1800	2200	X Z	40 020.1 70 198.8	39°29.5	73°17.3	
	1825	2225	X Z	39980.1 70211.9	39°28.4	73°09.9	H/T Sta #115
	1843	2243	X Z	39978.7 70212.7	39°28.4	73°09.6	End Sta #115 A/C 107°C
	1905	2305	X Z	39 950.6 70 236.0	39°26.4	73°03.2	XBT
	1920	2320	X Z	39-927.3 70-245.7	39°26.0	72°59.3	H/T STA # 116
	1938	2328	X Z	39-927.5 70 246.5	39°25.8	72°59.0	End STA # 116 F/A 107°C
	2000	2400	X Z	39899.5 70268.2	39°24	72°57.6	
	[illegible]	[illegible]	X Z	39866.4 70287.1	39°22.5	72°46.4	STA #117
	2048	2048					End Sta #117 A/C 102° F/A

Vessel [illegible]

Cruise [illegible]

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Date	Time	Sta.	+/-.	Reading	Latitude	Longitude	Remarks
7-13	0000	0400	Y Z	50712.9 70274.7	39°36.9	72°06.5	
	0030	0433	Y Z	50624.3 70248.1	39°43.5	72° 02.0	
	0100	0500	Y Z	50530.7 70220.6	39°50.5	71°56.5	A/C 026°C
	0130	0530	Y Z	50446.9 70196.3	39°56.4	71° 52.6	XBT
	0200	0600	Y Z	50354.8 70171.0	40°02.9	71°47.4	
	0212	0612	Y Z	50318.0 70161.0	40°05.5	71°45.5	XBT
	0230	0630	Y Z	50265.4 70146.1	40°09.4	71°42.3	
	0251	0651	Y Z	50201.5 70128.9	40°14.0	71°39.0	H/T Sta #119
	0319	0719	Y Z	50196.7 70126.8	40°14.4	71°39.0	End Sta #119 A/C 027°
	0330	0730	Y Z	50165.6 70117.3	40°17.0	71°37.0	A/C 022°C
	0348	0748	Y Z	50113.5 70101.0	40°20.8	71°34.5	XBT
	0400	0800	Y Z	50 079.8 70 091.0	40°23.5	71°32.7	
	0423	0823	Y Z	50 034.3 70 073.6	40°27.5	71°33.0	H/T #120
	0440	0840	Y Z	50 034.0 70 073.4	40°27.4	71°01.6	End Sta F/A 027°T
	0500	0900	Y Z	49 972.6 70 055.8	40°32.5	71°27.0	XBT
	0520	0920	Y Z	49 916.8 70 037.0	40°36.8	71°25.0	H/T STA #121
	0537	0937	Y Z	49 909.6 70 035.8	40°37.2	71°24.5	End STA F/A 022°GY
	0600	1000	Y Z	49 848.0 70 016.7	40°42.2	71°21.5	
	0620	1020	Y Z	49 803.1 70 001.3	40°46.0	71°19.2	H/T STA # 122
	0633	1033	Y Z	49 800.0 70 001.3	40°46.5	71°19.3	End STA F/A 023°GY
	0700	1100	Y Z	49 729.5 70 979.3	40°52.3	71°15.2	
	0705						XBT
	0733	1133	Y Z	49 652.6 70 953.9	40°59.0	71°11.0	H/T STA # 123
	0743	1143	Y Z	49 652.6 70 953.4	40°59.0	71°11.2	END STA F/A 020
	0812	1212	Y Z	49586.5 69931.5	41°05.0	71°07	
	0846	1246	Y Z	49508.6 69905.3	41°12.4	71°02	H.T. STA #124

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Date	+4 Time	GMT Sta.	+/-.	Reading	N Latitude	W Longitude	Remarks
7/12	2100	0100	X Z	39847.3 70298.6	39°21.6	72°42.	
	2125	[illegible]	X Z	39810.2 70319.0	39°20	72°35.	HT STA# 111
	2140	0140					END STA# 118 FIA
	2230	0230	X Z	39730. 70351.0	39°18.0	72°22.0	c/c 030°T
	2300	0300	X Z	39646.0 70327.3	39°24.0	72°16.5	

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+4 East

W W

Date	Time	Sta.	+/-.	Reading	Latitude	Longitude	Remarks
7/13	0800	1853		49479.7 49896.1			END STA 0/0018° E/D